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Techniques for the development of a work...

[Washington]

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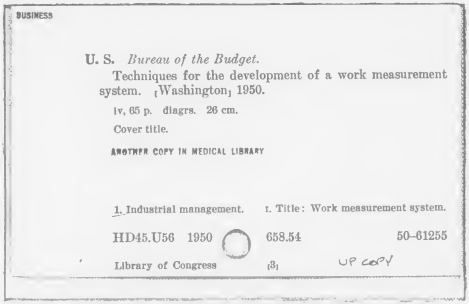

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Techniques

FOR THE DEVELOPMENT OF A

WORK MEASUREMENT SYSTEM

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March 1950

EXECUTIVE OFFICE OF THE PRESIDENT
BUREAU OF THE BUDGET

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WORK MEASUREMENT MATERIALS AVAILABLE

Bureau of the Budget working guides and discussion materials on work measurement, listed below, are sold by the Superintendent of Documents, Washington 25, D. C.

- A WORK MEASUREMENT SYSTEM: DEVELOPMENT AND USE (*A Case Study*), March 1950—A comprehensive statement of the principles of development, installation, and use . . . for management improvement, program scheduling, and performance budgeting . . . as applied in one large agency, the Office of the Adjutant General. (30¢)

- TECHNIQUES FOR THE DEVELOPMENT OF A WORK MEASUREMENT SYSTEM, March 1950—A hypothetical Case Study covering (1) the analysis of needs for work measurement in relation to program planning, budget administration, and general management, (2) the selection of valid work units, and (3) the development of necessary forms and reporting procedures. (35¢)

- WORK MEASUREMENT IN PERFORMANCE BUDGETING AND MANAGEMENT IMPROVEMENT, March 1950—Booklet of visual charts, 8" x 10½", for orientation of executives and supervisors on the purposes, uses, and main steps in the development of work measurement. (30¢)

For List of Management Bulletins on other subjects see inside back cover

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 35 cents

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PREFACE

This manual is intended for the use of the management analyst responsible for the mechanics of installing a system of work measurement. It is, therefore, limited to a detailed discussion of (a) how a work-measurement reporting system fits into the needs of an agency for various types of reporting systems, (b) the difficult task of selecting appropriate units for the quantitative measurement of work output, and (c) the design and installation of a standardized form of reporting to insure the collection, transmission, and analysis of data pertinent to adequate work measurement.

The manual does not treat the problems of establishing standards and using the resulting information after a work-measurement system is installed. Those subjects are discussed at length in the Bureau of the Budget Management Bulletin entitled "A Work Measurement System: Development and Use (A Case Study)".

In actual practice, it is impossible to develop a measurement system to meet management's needs, unless the type of system to be installed is tailored to the specific uses intended. The system developed in this case study is intended to serve in (a) the estimating of personnel and work-load requirements for the preparation of budget estimates, (b) the administration of personnel and fund allotments in the execution phase of budgeting, (c) the control of operations through adequate staffing and adequate distribution of work loads, and (d) the administration of a system of incentive awards and effective personnel training and placement.

Although the methods of using the information produced by a work-measurement system are not discussed in this manual, Part I -- on determining an agency's work-measurement needs -- describes the kinds of information an organization requires for efficient administration and the role of work measurement in meeting these requirements.

Work measurement, as defined in this manual, is a system of establishing an equitable relationship between the volume of work performed and the employee time expended in performing that volume. The relationship established provides the basis for comparing employee utilization in like operations performed at different locations, and for comparing employee utilization in the same operation at the same location over a period of time.

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Nevertheless, the work-measurement analyst should be aware of the possibilities which lie in just time reporting alone. In certain types of work, it is almost fruitless to find a work unit for operations performed. In those instances, however, the need for controlling work is no less important than in measurable types of operations. A basis for control may be found in simple time reporting on all work done. The reporting of time alone makes it possible to know how staff time is being distributed among the activities or operations performed. Knowing that, it then becomes possible to make decisions on whether more or less emphasis ought to be placed on each activity or operation in order to achieve the results desired.

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Part I

THE HYPOTHETICAL AGENCY AND ITS REPORTING NEEDS

Let's assume that CBA, a purely hypothetical agency, was established by Congress in 1935 to administer the provisions of Public Law XXX. That law, let's also assume, places under Federal supervision the manufacture and distribution of a certain commodity; specifies that manufacturers must be licensed; and sets forth standards to be maintained, methods of distribution, and penalties to be imposed by the agency upon those manufacturers and distributors not in compliance.

CBA has its central office located in Washington and operates through 10 regional offices located throughout the United States. The organization of CBA is as shown in Figure 1.

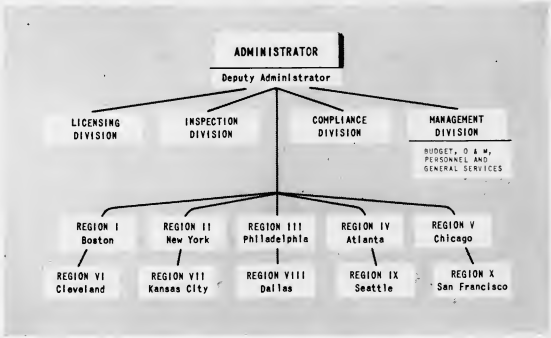

FIGURE 1

The work of the agency is carried on largely by the regions. The national office prescribes the procedures. The work of the regional offices involves:

1. Determining eligibility and issuing licenses to those manufacturers and distributors who qualify;

2. Reviewing licenses annually on the basis of application;

3. Making in-plant inspections of applicant manufacturers and distributors,

4. Obtaining compliance with the law by plants that have not applied for licenses.

The central office exercises general supervision over the regions, to which it has delegated operating authority. The administrator and deputy administrator depend on personal inspection, conferences of regional directors, and reports to keep them informed about the status of activities and the condition of operations in the field.

The agency has a rather comprehensive reporting system, including a work-measurement system. Going on the assumption that an adequate reporting system calls for a complete understanding of the agency's objectives, functions, operations, and the manager's need for information, all of the separate reports are part of one integrated reporting structure. To install a useful work-measurement system, it is important for technicians to know:

1. What information responsible officials need to have;
2. What information is already available;
3. What information must still be provided.

In order to make clear the background into which CBA's work-measurement system was made to fit, the agency's evaluation of its informational and reporting needs are analyzed in the remainder of this section.

Modern business and Government organizations have grown so large and so complex that the technique of "remote control" has had to be perfected. Loose organization achieved merely by the delegation of personal authority is not effective in the modern Government agency. Top management, separated as it is from the details of current operations, requires more than just personal contact to effect control. Furthermore, the problem of coordinating the operation of a large enterprise is such that management must exercise intelligent foresight in planning operations and formulating effective policies.

The fundamental characteristic of the type of remote control which management needs to bridge the gap between itself and actual operations is the more effective use of records and reports -- more specifically the gathering and interpretation of the facts contained in records and reports. Facts, for management purposes, are those data (narrative and quantitative) which express in simple terms the current standing of the agency's program, work, and resources in relation to the plans and policies formulated by management. They are those facts or measures (1) which permit management to compare current status with past performance and with its forecasts for the immediate future, and (2) which provide management with a reliable basis for long-range forecasting. The types of information that management needs to know about agency program, work, and resources are indicated by the following considerations:

Agency Program

- Is the agency achieving the public purposes for which it was established?
- Is progress in achieving those purposes in accord with the progress planned?
- Is there a need for the existing emphasis or change in emphasis on the various aspects of the program?

Agency Work

- Is the volume of work undertaken during a specified period the volume needed to achieve agency purposes?
- Is the volume undertaken being completed on schedule?
- Are the results produced by the various types of work the results desired?

Agency Resources

- Are funds allocated and controlled in close relation to current needs?
- How fully is available manpower being utilized and how well are manpower and work load balanced throughout the organization?
- How fully are available supplies, equipment, and property adequately utilized?

Those questions are indicative of the facts management needs to know to control the work of the agency, to increase the productivity of its available manpower resources, and to keep program, work, and resources in balance.

The management staff of CBA had attempted, early in the agency's life, to provide the administrator with a complete reporting system designed to answer those questions. As happens in a good many agencies, CBA has been the victim of an increasing number of reports -- CBA management staff having failed to give adequate consideration to the fact that the task of management is usually not so much to require the development of new systems of records and reports as it is to review, evaluate, and make changes in existing systems, in order to make possible increased management use of program and work data.

PROGRAM REPORTS

Program may be defined as a major segment of effort in which the agency engages in order to fulfill its public purposes. In some instances, the laws creating an agency are explicit in their statement of what the agency is intended to achieve. In other instances, the agency purposes require considerable administrative and legal interpretation. Only when it has defined the public purposes or objectives of the agency can management expect to be furnished with pertinent factual information about various aspects of the program.

Management, then, needs to know relative to program, Is the agency achieving the public purposes for which it was established? CBA needed to know from the beginning, and still must base its activities on the answers to such questions as: How many plants, potentially, must have licenses under Public Law XXX? How many plants are licensed? How many are in violation? What industries are the most frequent violators? What is the trend in the rate of compliance as a result of CBA's work? What means is being used both to achieve compliance and to detect violations? What results are being achieved by those methods?

From year to year the index of the effectiveness of CBA's program effort is reflected in changes in the compliance rate. It is on the basis of that rate, that CBA plans its long-range program and the scope and emphasis of its annual program plan.

During the course of an appropriation period, current analysis and presentation of those data, related to what management planned to accomplish, provides management an indication of deviations from the plan. Management then is able to make necessary adjustment in plans. The answers to questions such as those raised above give the CBA administrator the information needed to judge whether the methods which have been selected to achieve the agency objectives are the best. For example, are the best results achieved by apprehending violators, or should a publicity program be used more extensively to encourage violators voluntarily to apply for licenses?

Management also must know, Is the agency progressing in achieving its purposes in accordance with progress planned? Like the majority of Government agencies, CBA carries on a continuous program. Its job will not be completed in a single appropriation period. It is, therefore, necessary to specify the purposes or objectives in relation to periods of time. Plans are laid out on a long-range and annual basis, while for management purposes the annual period is further subdivided into quarterly and monthly reporting periods.

In that way, information on the progress of the agency in attaining its objectives can be related to the progress planned. Deviations from the plan can be observed on a current basis, and adjustments made before the end of an appropriation period. Management is thus in a position to control the direction of the program, and to keep its progress on schedule. In addition, that same information is necessary in making more reliable progress plans for future periods.

Another program interest of management raises the question: Is there a need for the existing emphasis or change in emphasis on the various aspects of the program? In attaining the program objectives during an appropriation period or over a longer period of time, quantitative measures of the need of the program and of emphasis on certain aspects of the program are necessary. The need for a program may increase or diminish over a period of time, and management should be informed of those changes as they occur.

For example, the law which created CBA did provide for the licensing of certain industries, but the purpose of licensing was to bring those industries into compliance with the substantive provisions of the law. The administrator of CBA knew, therefore, that merely processing licenses year after year would not satisfy the intent of the Congress in passing the law. He would have to know the coverage being obtained and make decisions from time to time on changes in emphasis on methods of obtaining compliance.

Many questions relating to program need can be answered quantitatively, but the measures must be valid. The CBA central office staff, on examining the inspection records of one region, found that the number of inspections for a six-month period were equal to the number of covered plants in the region. Yet only half of the plants in the region had been inspected. In other words, the definition of the term "inspection" was inadequate and the reports, therefore, misleading. An erroneous decision on future inspection needs would have been made on the basis of the reported data.

Qualitative aspects of program need can also be measured. Quality is equally important in analyzing continued need for the program. Here again CBA found itself unintentionally at fault. The original assumption that all plants had to be inspected each year was not necessarily wise. Principally because of limited staff and funds, questions began to be raised concerning the necessity of regular inspections in industries having a good record of voluntary compliance.

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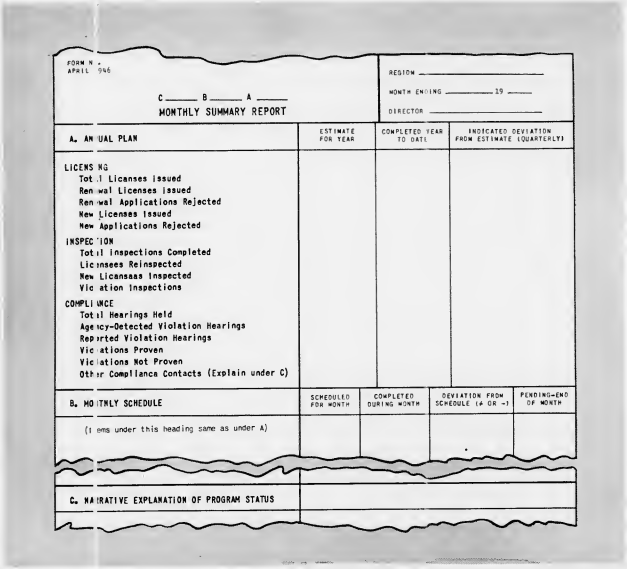
The kinds of data that the CBA central office gets to help it make such program decisions are illustrated by the report form suggested in Figure 2.



FORM N
APRIL 1946

C ____ B ____ A ____

MONTHLY SUMMARY REPORT

REGION _____
MONTH ENDING _____ 19 ____
DIRECTOR _____

A. ANNUAL PLAN	ESTIMATE FOR YEAR	COMPLETED YEAR TO DATE	INDICATED DEVIATION FROM ESTIMATE (QUARTERLY)
LICENSING			
Total Licenses Issued			
Renewal Licenses Issued			
Renewal Applications Rejected			
New Licenses Issued			
New Applications Rejected			
INSPECTION			
Total Inspections Completed			
Licensees Reinspected			
New Licensees Inspected			
Violation Inspections			
COMPLIANCE			
Total Hearings Held			
Agency-Detected Violation Hearings			
Reported Violation Hearings			
Violations Proven			
Violations Not Proven			
Other Compliance Contacts (Explain under C)			

B. MONTHLY SCHEDULE	SCHEDULED FOR MONTH	COMPLETED DURING MONTH	DEVIATION FROM SCHEDULE (+ OR -)	PENDING-END OF MONTH
(Items under this heading same as under A)				

C. NARRATIVE EXPLANATION OF PROGRAM STATUS	

FIGURE 2

All the above information is obtained from the central case-status record file in each regional office. From this kind of information, supplemented by periodic management audits, decisions can be made on both program and work status.

WORK REPORTS

Management not only has to determine the public purposes of the agency, and develop a program consistent with those purposes, but has to prescribe, also, the work to be performed to accomplish the program. Management should then be continually informed about all of the operations and activities which compose the work of the organization throughout the country. Quantitative measures of the output and quality of work provide a means of reducing those details into simple, understandable terms.

Management must ask: Is the volume of work undertaken during a specified period the volume needed to achieve agency purposes? Having defined its purposes or objectives and its activities, an organization must know how much work must be accomplished within a given period of time in order that the objectives may be met. Knowing what the total potential clientele of CBA is, the administrator relies on the staff responsible for work planning and reporting to estimate the volume of work which CBA ought to perform. That volume would have to be consistent on the one hand with the resources available and on the other with a favorable goal of compliance.

With respect to the work involved in granting licenses, in making inspections, and in holding hearings, certain factors in addition to availability of resources and the compliance rate have to be considered in planning CBA's workload:

1. Speed or promptness. The Government's "customers" are, in many instances, sensitive to the speed with which they are served. This is particularly true in CBA's issuance of licenses. Since businesses are in violation of the law if they are not licensed, those businesses that do attempt to comply by applying must receive their original and renewal licenses promptly. Also, plants in violation, when finally called to a hearing, deserve a prompt hearing despite their having been at fault in the first instance.

2. Accuracy. Speed may not be the only test of the volume of work to be planned. Speed may have to be tempered by the consideration of accuracy -- accuracy in the completion of license forms before they are issued to the licensees, accuracy in the compilation of facts and findings before hearings are held, accuracy in the judgment of findings during inspection. Consideration of the need for accuracy and of evidence that accuracy standards are not being met makes way for management action to improve working procedures and employee skills.

3. Adequacy. Volume of inspections may be planned or reported merely in terms of numbers of inspections performed or to be performed. The more attention, however, that is given to volume alone, the less certain the inspections are to be adequate. In other words, a program of adequate inspections is one which makes the maximum number consistent with covering the right industry groups, in the proper proportion according to the incidence of violation, and in the correct proportion among the regions of CBA.

Having planned the volume of work to be performed, management is then interested in knowing: Is the volume of work undertaken being performed on schedule? Management not only has to plan the volume of work to be undertaken, but should also plan the schedule to be maintained. In that way, work can proceed steadily over the appropriation period, or other scheduled time period, with some assurance of completion. The work volume completed should be reported in relation to time, so that deviations from schedule can be observed and acted upon.

The progress report of CBA includes data on the volume of work received or undertaken, the volume completed, and the volume awaiting completion. With those data, CBA management can compare the rate of performance with the schedule planned, identity operations ahead of or behind schedule, and locate bottlenecks. CBA management also uses the data to schedule work for future periods and then to adjust the schedules.

Finally, management wants to know: Are the results produced by the various types of work undertaken the results desired? One measure which is of vital importance on a current basis is the measure of the results being produced by performing work compared to the results anticipated. This measure is needed by management in order to control the volume of work undertaken so that the results produced by that work will be those desired.

For example, the CBA staff responsible for achieving compliance of industry with provisions of the public law may classify the volume of inspection work to be undertaken by type of industry and by geographic area. Data on the results of inspections in one type of industry may reveal the existence of a high rate of compliance in that industry, and therefore, the volume of work planned may be diverted to another type revealing a high rate of non-compliance. Without current factual information on the results produced, CBA management will not be able to shift its work plans, and thus utilize its resources to achieve its public purposes.

Without experience data of this type, management cannot plan too reliably the scale of the program necessary to achieve program objectives in future periods.

RESOURCE REPORTS

Agency resources are generally recognized as including funds, manpower, supplies, equipment, and plant. The performance of an agency's work involves all these resources -- the availability and efficient use of money appropriated or earned, manpower procured and assigned, and the supplies, equipment, and plant needed to run the organization and produce its product. The availability and use of resources is a threefold problem -- accurate estimating in relation to work planned, timely procurement in relation to work scheduled, and current allocation in relation to keeping in balance the work planned and the work performed.

Money -- the resource which makes all other resources possible -- raises the question: Are funds allocated and controlled in relation to current needs? An administrator does not have an absolute right to decide the total amount of money that is to be appropriated to his agency. He does, however, need measures which will help him perform his principal financial responsibility. That responsibility is to inform his superior executive official and the Congress what level of performance and results can be and are being provided with any given expenditure.

The "consumers" of financial information prepared by an agency include:

1. The operating official immediately in charge of a project or activity;

2. The official's superiors within the agency who have more general responsibility;

3. The several central agencies including the General Accounting Office, Treasury, and Bureau of the Budget, which serve the Congress and the President;

4. The Congress directly;

5. The public.

Most especially, however, the administrator of CBA believes that the responsible officials in the agency, including himself, need financial reports in order that they may be able to:

1. Ascertain financial condition and the financial result of operations with particular reference to authorized spending limits;

2. Review the use of funds in relation to program and administrative plans;

3. Compare the financial aspect of the program with accomplishment;

4. Obtain information on financial operations and current conditions as a basis for current decisions, forecasts and future budget formulation;

5. Demonstrate that all funds have been accounted for.

In order that financial reports of the agency may serve those purposes, the CBA budget officer prescribed the following general specifications:

1. Statements should originate from a balanced and reconciled set of accounts;

2. Statements should be adequate for the needs of the user (that is, no information should be withheld which would materially alter the conclusions to be drawn from the statement);

3. Statements should include enough program data to make it possible to measure utilization of money in program accomplishment.

With respect to manpower resources, management needs to know: Is available manpower being fully utilized and are manpower and work load balanced throughout the organization? Most agencies need a system for recording and reporting information on work load produced and manpower utilized. The administrator of CBA learned early that the Civil Service Commission, on a recurring basis, and, that Congressional Committees and the Bureau of the Budget, from time to time, ask questions on the number of employees working in the organization or the number of employees in particular salary levels or occupations.

Once a year, CBA had to submit a budget estimate to the Bureau of the Budget. The Bureau had put increasing stress on a performance budget, which places emphasis on unit costs and production rates, such that forecasts of work volume in relation to the annual performance per employee can be readily transformed into personnel requirements, which in turn can be translated into estimated funds required.

Furthermore, since 1946, CBA has had to justify, each quarter, its personnel needs for ceiling control purposes. The Federal law which places limitations on the number of people which an agency may employ is administered by the granting of quarterly allotments of positions to each agency. Detailed information built up from continuous records of how manpower is used facilitates justification of ceiling requirements.

Most important of all, however, the administrator of CBA had learned from earlier experience in both industry and Government that it was prudent to have adequate manpower at each location in the organization, while at the same time, not allowing excessive manpower. In CBA particularly the rate of accomplishment of the total job depended vitally on the efficient use of employees.

It is important also that management inquire: Are available supplies, equipment, and property adequately utilized? Regardless of how small the cost may be for these resources in any one agency, there is a heavy responsibility for efficient utilization. There are such management decisions as the following to be made:

1. Purchase vs. rental of land, buildings, equipment, etc.;

2. Replacement vs. repair of buildings and equipment;

3. Purchase vs. redistribution or reassignment of present equipment;

4. Long-distance telephone and telegraph vs. travel;

5. Printing vs. other duplicating processes.

In some agencies the rental fees paid for some types of mechanical equipment cannot be justified unless the equipment is used to capacity. In other agencies certain equipment may no longer be necessary. In both instances, management should be currently informed of the equipment available, its condition and rate of use. On the basis of that information, management can act to increase the utilization or to declare equipment surplus.

Part II

SELECTING UNITS OF MEASURE FOR WORK AND TIME

Part I covered in general the reporting needs of CBA. The remainder of this publication will show how a work-measurement system was developed to help meet those needs.

Chronologically, the work-measurement system was the last reporting procedure to be developed. Among the first reports set up were those dealing with number of personnel, since those were standard reports required by outside agencies. Next, the administrator needed reports on work load, because some kind of data for work-load forecasting were needed for budget formulation and for requesting fund apportionments and ceiling allocations. Some such data were needed also to make further allotment of funds and ceilings within the agency.

As a next step, the administrator began to feel the need for more quantitative information for programming and scheduling purposes in order to:

1. Make program and work commitments;
2. Schedule the use of manpower and facilities;
3. Reveal and appraise the status of operations.

That kind of information was particularly important in answering questions relative to need for funds, accounting for the use of funds in achieving results, planning operations so as to obtain optimum efficiency, and improving operations so that the most effective job could be done within available funds and manpower.

However, having recognized those general needs, the administrator found that existing reports were not adequate. Detailed problems had to be solved which required information in such a form as to permit analysis of work volume in relation to manpower utilized in performing that volume. It is that relationship which is the essence of a work-measurement system. Specifically, the kind of decisions which information based on that relationship could help make were as follows:

1. In budgeting, to
   (a) Determine, explain, and evaluate program cost,
   (b) Determine, explain, and evaluate personnel requirements,
   (c) Determine approximate unit costs;

2. In relation to internal management, to
   (a) Keep manpower and work load in balance,
   (b) Indicate the need for management studies,
   (c) Check results of management action taken,
   (d) Relate the personnel program to management needs,
   (e) Provide a basis for incentive awards;

3. In general, to
   (a) Compare the work performance of one region with another,
   (b) Compare individual regions or the whole agency on a time-trend basis.

The management staff recommended the installation of a plan of work measurement. After reviewing the details of such a project with that staff, the administrator informed his division directors, budget officer, and regional officers that a work-measurement project was to be undertaken. He asked for their cooperation as an essential factor in the project's success.

The administrator also established a work-measurement committee to act in an advisory capacity to the management staff. The committee was composed of the program directors of the central office, the agency budget officer, personnel officer, and the deputy administrator. The administrator said that he wanted a thorough study which would result in all measurable work of the agency being covered by the work-measurement system; and he asked for recommendations from the committee regarding a work schedule to accomplish that objective.

After some study the committee came to the conclusion that the total job should be broken down into three parts: (1) program work in the regions, (2) administrative services in the field and in the central office, and (3) program work in the central office. The administrator approved a plan calling for development and installation in that order.

IDENTIFYING MEASURABLE WORK

The selection of units to measure work performed and employee-time expended is perhaps the most time-consuming and most technical step in the planning and development of an agency work-measurement system. To assure validity in the work data and employment data that are to be accumulated for work-measurement purposes, it is essential that all organization segments of an agency use the same units, and define and count those units in the same way.

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In order that the proper units of measure for CBA might be determined, there had to be consistency in:

1. Classification of the measurable and unmeasurable work of the agency;

2. Classification of the measurable work into activities and component operations;

3. Definition of the units selected to measure the operations.

The term work-measurement suggests that it is necessary to select units to measure both work output and employee-time expended, for every type of work performed. It should be recognized, however, that it is sometimes impracticable to measure output in some types of work because factors other than the volume of work done or to be done may govern the number of personnel required. In most agencies, the number of employees performing such unmeasurable work is small in relation to the total number of the employees in the agency. Although the work of those employees will not be measured, it is nevertheless important that the time expended by them be recorded and reported in appropriate time units.

Measurable work, in contrast to unmeasurable work, can be counted in units of output. Measurable work usually absorbs the major portion of the manpower of an agency, and the numbers of employees required are directly related to the volume of that work. Selection of applicable work units for measurable work requires careful analysis and uniform classification.

Unless steps are taken to distinguish between unmeasurable and measurable work, and to account for the time of all employees in the organization segments covered by the work-measurement system, the results obtained may not be valid. More important, the results will not provide a complete picture of employee utilization in the organization segments covered.

Factors other than work volume which in particular instances may determine personnel requirements include:

1. Statutory provisions (the "X" Board must have three members);

2. Organization structure (chiefs of bureaus, offices, etc., and in many cases, their personal staffs);

3. Open-end objectives and unpredictable results (as in certain types of research work); and

4. "Fixed" installations (guard towers in prisons, small field offices operated for the convenience of clientele irrespective of work volume, etc.).

Where such conditions govern the manning of certain positions, the selection of an appropriate work unit may be unnecessary, and the work-measurement system can be simplified by requiring time reporting only.

The management staff of CBA made a careful analysis (1) of the organization structure of the regional offices of CBA, and (2) of the regional reports on work volume and personnel to ascertain what types of work were measurable and what types were unmeasurable.

In the regions, the organization structure was generally similar to the pattern of the central office (see Part I); but licensing, inspection, and compliance requirements of the geographical area served governed the specific type of organization. In those regions in which the volume of work was greatest, the organizational structure of the regional office was like that shown in Figure 3.

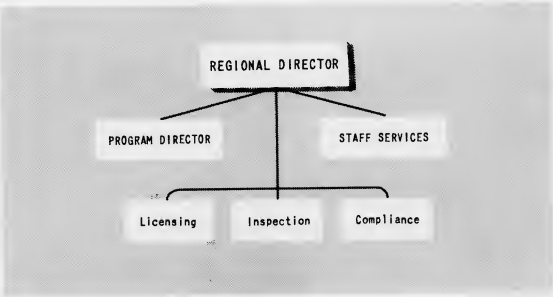

FIGURE 3

In some other regions, licensing work was performed in one unit, but inspection and compliance were combined into a single unit, Figure 4.

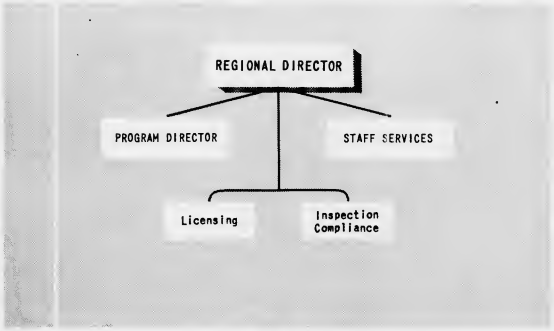

FIGURE 4

In those regions with the smallest volume of work, there was but one organization unit responsible for licensing, inspection, and compliance, and one unit responsible for all staff services, Figure 5.

FIGURE 5

From this preliminary analysis, it became apparent that there was one regional director in each region — a fixed personnel requirement. In addition, the staffs of the regional directors' offices were identical in all regions, regardless of size, volume of work, or total number of employees in a region. Those identical staffs were prescribed by the central office and were considered to provide the minimum facilities required by each regional director.

Because the personnel requirements of the regional directors' immediate offices were unrelated to the work volume in the region, no attempt was made to measure the work produced by those staffs. Definitions and instructions prepared to cover the regional directors' offices classified the work as unmeasurable and provided for the recording and reporting of employee time only.

The work-measurement committee agreed that, except for the regional directors' immediate staffs, the personnel requirements of the regions were related to work volume. They observed, however, that the regional reports on work load then in use did not necessarily show the volume of work performed; nor did the personnel reports show time worked by the employees in the region in such a way that it could be related to the volume of work produced.

For example, the monthly program reports included data on the total number of inspections completed; but without some examination of the inspection work load, it could not be assumed that "total inspections completed" would be a good unit for work-measurement purposes. The monthly personnel reports showed the total number of employees in each region at the beginning of the month, the number of accessions and separations during the month, and the number at the end of the month. In addition agency reports showed the distribution of employees at the end of the month according to the sections of the organization to which they were assigned. It was not possible, however, to ascertain the amount of time actually worked by those employees during a month, or the distribution of their time among inspection work, compliance work, and licensing work.

Therefore, the measurable work of the regions had to be analyzed and classified in such a way that all regions could uniformly record and report total work volume completed and charge employee time to the work categories in which time was expended.

ANALYZING THE MEASURABLE WORK

The purpose of analyzing and classifying the measurable work of an agency is to assure that the work-measurement results ultimately obtained will be valid and will be reliable for purposes of comparison, control and prediction.

Criteria

The criteria of validity and reliability which the CBA analysts applied as they analyzed the work of the agency are outlined below.

Validity

The validity of work-measurement results is dependent upon the work unit selected. It is, therefore, essential to consider the tests to be applied in selecting this unit of measure. The characteristics of a valid work unit for work-measurement purposes are:

Countability of output. The work unit should relate to performance and completion of a specific action so that output can be counted. A work unit usually can be identified readily for operations related to processing (production-type operations). It is not necessarily difficult to identify work units for service-type operations. Some countable completed document, report, or other paper will frequently reflect the work that has gone into performing the office or service operation.

Consistency of definition. The work unit should require a fairly uniform amount of employee-time for the output of each item of work represented. Most work-measurement systems are designed primarily as tools for day-to-day management of an agency. To be useful for that purpose, the time requirements of a work unit should average out in a relatively short period -- a day, a week, or a month. But for annual budget formulation, it is sufficient for the time requirement of a work unit to average out over a period of a year. It is possible, therefore, for some types of work to be measurable for budget purposes although they cannot be measured for current management purposes.

Reflection or measurement of work effort. Units used to express program results or accomplishments may be, but are not always, applicable units for work measurement because they do not always reflect the volume of work (time and effort) actually performed in achieving those results or accomplishments.

For example, in CBA's licensing activity, results of processing license applications may be measured in terms of the number of licenses issued, whereas work volume may be measured in terms of the number of license applications processed (including those not approved).

Similarly, in CBA's industrial inspection activity, work volume may be measured by the number of industrial establishments inspected, whereas a unit which will measure, at least in part, the results obtained by inspection of establishments will be the number of approved establishments.

In a program of health education conducted through sponsorship of special public school classes in hygiene, work volume may be reflected in the number of classes sponsored; results may be measurable in terms of the number of children completing the classes; and accomplishments may be reflected by changes in sickness rates among children reached by the program.

Consistency in quality of work. A work unit should relate to work of similar quality over the time period and among the organization segments to which it applies. In some instances quality is rather automatically determined by external requirements or by the very nature of the work; in other cases, however, the definition of the work unit must include a specific statement of quality standards if data on work volume are to be useful. Where a purported "unit" actually relates to work of a quality which may vary widely or which is not subject to objective definition, figures on volume are likely to be misleading unless carefully interpreted.

In addition, there are obvious advantages to using a minimum number of work units to measure output. Validity of the data on work volume should not, however, be impaired by over-emphasizing simplicity and selecting only one work unit where two or more are required.

Reliability

It must be possible to compare work-measurement results for one time period among all segments of an agency which perform the same type of work as well as to compare the results in a single operation on a time-trend basis. The characteristics of a reliable work unit for work-measurement purposes are:

Comparability. Agency-wide comparability requires that all segments of the agency measure the same work in the same units and use the same methods of counting and reporting. Comparability on a time-trend basis requires the same type of comparability from one time period to another. The sameness applies to both the method and the quality of the work.

Ability of verification. Data on work-unit volume should tie into work control records covering work received, completed, and on hand.

Classification

There are three possible methods of classifying the work of an agency for work-measurement purposes:

1. Grouping work by like organizational segments;
2. Breaking work down into individual processes or steps;
3. Classifying the work into functions, component activities, and operations.

The third method was eventually found to be the most satisfactory but the application of each method, in turn, was attempted in CBA.

Classification by Organizational Segment

Nearly every agency initially classifies work according to organizational structure, and CBA was no exception. For example, the management staff of CBA concluded that the simplest method of classifying the program work of the regions was by the three sections in the organization: (1) Licensing, (2) Inspections, and (3) Compliance. The staff at first thought that the maximum number of sections would be three, possibly requiring only one work unit per section and making possible an exceedingly simple work-measurement system. The staff proceeded to define the work of each section and tentatively selected a work unit for each as follows:

Licensing. Includes all work performed by employees assigned to licensing section in processing applications for licenses as described in the procedures manual.
Work unit - a license application completed.

Inspection - includes all work performed by employees assigned to the inspection section in making inspections of applicant plants, preparing inspection reports, and locating non-applicant plants.
Work unit - an inspection completed.

Compliance - includes all work performed by employees assigned to the compliance section in attending hearings and preparing reports of hearings.
Work unit - a hearing completed.

When this plan of classification was discussed with the work-measurement committee, it was found to be unsuitable and was discarded for the following reasons:

1. As shown in Figures 1,2, and 3, separate organization sections for licensing, inspection, and compliance did not exist in every region.

2. In some regions the clerical and stenographic employees were assigned to the program sections, while in others stenographic and clerical services were pooled for the entire regional offices. Under such conditions employee time could not be related to work output when data on work and time were accumulated on an organization basis. Consideration was given to the establishment of a standard organization. That approach did not appear feasible, however, when it was pointed out that —

3. Employees assigned to a section did not necessarily work full-time in that section. In the smaller offices, in particular, employees divided their time among licensing, inspection, and compliance work; and in all offices the inspectors spent some time in compliance work.

Classification by Component Work Steps

The management staff then made a detailed analysis of the steps followed in one region in processing applications for new licenses (Type A) and applications for renewal of licenses (Type B). This analysis was charted as shown in Figures 6 and 7, on pages 22 and 23.

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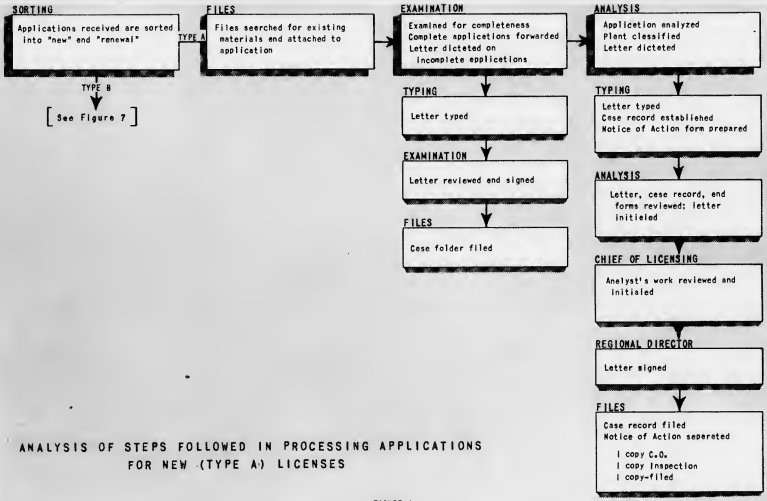
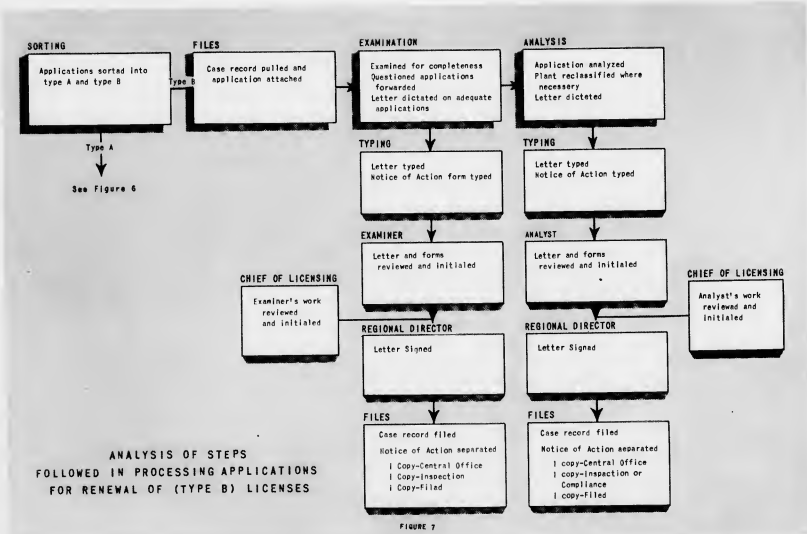


ANALYSIS OF STEPS FOLLOWED IN PROCESSING APPLICATIONS FOR NEW (TYPE A) LICENSES

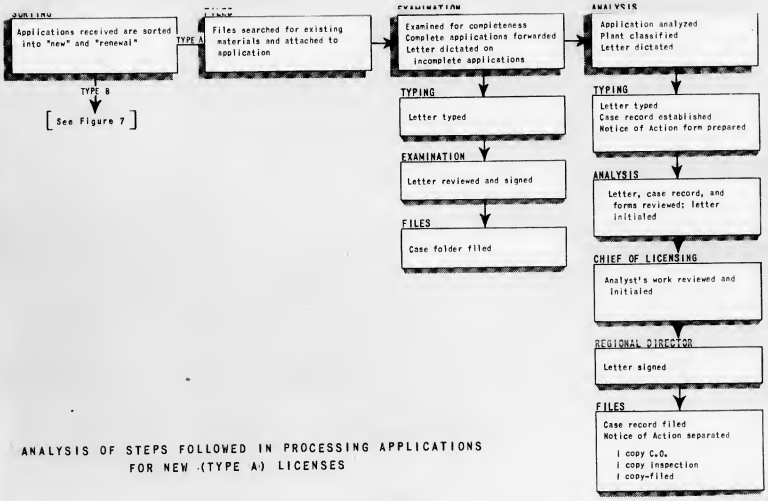
FIGURE 6



ANALYSIS OF STEPS FOLLOWED IN PROCESSING APPLICATIONS FOR RENEWAL OF (TYPE B) LICENSES

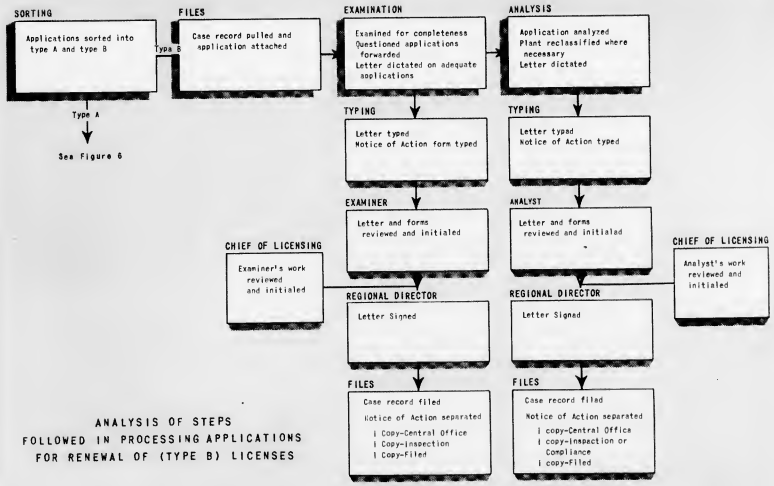
FIGURE 7

INTENTIONAL SECOND EXPOSURE



ANALYSIS OF STEPS FOLLOWED IN PROCESSING APPLICATIONS FOR NEW (TYPE A) LICENSES

FIGURE 6



ANALYSIS OF STEPS FOLLOWED IN PROCESSING APPLICATIONS FOR RENEWAL OF (TYPE B) LICENSES

FIGURE 7

On the basis of this analysis, a work unit could be selected for each work station (each box on the chart); but the diversity of the work units required for each station would prevent the portrayal of a comprehensive picture of the volume of work performed in processing applications. For example, the work units for the work stations in Figure 4 would be as follows:

Sorting - A Type-A application forwarded

Files - A file pulled
- A file placed back into pending files
- A case record filed
- A "Notice of Action" forwarded

Examination - An application forwarded
- A letter dictated
- A letter signed

Analysis - A letter dictated
- A letter reviewed and forwarded

Typing - A page typed on pending application
- A page typed on completed application
- A case record prepared
- A "Notice of Action" typed

Chief of Licensing - A letter initialed

Regional Director - (No work unit; time measurement only)

This approach would have called for 15 different work units. While such a step-by-step analysis is useful in improving methods and procedures, 15 separate work units were too many for work-measurement purposes. Regular reporting in such detailed terms would have been too costly and burdensome.

The number and diversity of the work units selected on that basis would have unnecessarily complicated a continuous reporting system and would have made it hard furthermore, to determine the actual output in licensing as a whole. One application could have been counted at least 15 times and in terms of at least 6 different work units -- an application, a file, a case record, a letter, a page of typing, a "Notice of Action." The analysis, however, pointed the way toward applying the third method of classifying work. 1/

1/ For assistance in analyzing work flow and procedures see the following Bureau of the Budget Management Bulletins: (1) Process Charting, Nov. 1945; (2) Production Planning and Control in Office Operations, Oct. 1949. (Supt. Documents, 35 cents.)

Classification by
Function, Activity, and Operation

Since classification of the work on neither an organizational basis nor a work-step basis had revealed units of output that met the criteria of validity and reliability without unduly complicated reporting requirements, the analysts proceeded to classify according to function, activity and operation.

Functions. For work-measurement purposes a function is defined as the general end or purpose for which work is performed. It was concluded that the work performed in the regions of CBA fit into two broad functions:

The Program function - that work which was performed directly for the purpose of carrying out the provisions of P.L. XXX.

Administrative services - that work which was performed as a service to the agency and its employees to facilitate their carrying out the agency program.

It had already been decided to postpone measurement of administrative services, because they consumed such a small proportion of manpower. The program function alone, therefore, was then classified into its component activities and operations.

Activities. An activity is defined as a broad category of work performed in accomplishing the function. In CBA there were three separate lines of program work: licensing, inspection, and compliance. Those activities were described as follows:

Licensing - that work involved in receiving, processing, and finally disposing of applications from manufacturers and distributors by denying, issuing, or extending a license, in accordance with the policies and standards prescribed by the central office.

Inspection - that work involved in (1) making in-plant inspections of those manufacturers and distributors who apply for licenses, or are currently licensed; (2) locating those plants covered by the law that have failed to comply; (3) preparing required reports; (4) assigning inspections; and (5) reviewing inspection reports.

Compliance was defined to include the work performed by CBA staff in (1) holding formal hearings to obtain testimony from CBA inspectors and officials of those plants for which the inspection findings indicated a violation; (2) preparing a report on each hearing; and (3) determining the action to be taken against the plants in accordance with the authority delegated to CBA under Public Law XXX. For work-measurement purposes, the name of this activity was changed to "Hearing Activity" because it was the term used in the regions to describe this work.

Each activity was then analyzed in order to ascertain its component operations and the need for dividing the activity into operations for work-measurement purposes.

Operations. An operation is defined as work of a specific character within an activity. As will be seen, that definition was interpreted to cover such homogeneous combinations of work steps as examining applications (three work steps common to both types of applications), and processing an application (four steps).

Identification of Operation Work Units

Having identified the functions, activities and operations, and having found the operation level generally favorable, the analysts continued their analysis to identify specific units of work within each activity.

Work Units in the Licensing Activity

From the detailed analysis of the Licensing Activity, as shown in Figures 6 and 7, the work-measurement staff had derived the following work steps:

Type A applications (Applications for new licenses)	Type B applications (Applications for renewal licenses)
1. Examined for completeness.	1. Examined for completeness.
2. Verified for conformance with legal requirements shown in "Procedures Manual."	2. Verified for conformance with legal requirements shown in the "Procedures Manual," and checked against existing case record.

Type A applications (Applications for new licenses)	Type B applications (Applications for renewal licenses)
3. Incomplete applications returned to the applicant under certain conditions, or letter written and application held pending reply. Applications conforming to requirements forwarded for analysis. Complete applications:	3. Questioned applications forwarded for analysis. Applications conforming to requirements: applicant is notified of extension of license and Inspection is notified of action taken. Questioned applications:
4. Analyzed.	4. Analyzed.
5. Applicant plant classified.	5. Applicant plant reclassified, where necessary.
6. Case record established.	6. Case record noted.
7. License issued or denied -- Inspection notified of action taken.	7. License extended or renewal denied -- Inspection notified of action taken.

The above analysis of work brought out the fact that every Type-A application proceeded through 7 steps (although some are held temporarily at step 3 until application is complete) and that every Type-B application proceeded through three of those steps, but did not always go beyond that point.

The analysis also suggested that the work at each step was substantially the same for both types of applications. That belief was confirmed by further questioning of employees performing the work. The only significant difference in the work performed on the two types of applications was in the number of steps through which they passed -- all passed through the first three steps; and all of Type A and some of Type B passed through seven steps. The work-measurement staff therefore combined the first three steps into a single operation, entitled "Examination Operation" and defined it as follows:

> The Examination Operation includes that work involved in sorting applications, searching files and pulling case records, examining applications for completeness and conformance with the procedures manual, preparing and typing letters regarding those Type-A applications which are found to be incomplete, and those Type-B applications which are not questioned.
>
> Work Unit - an application examined (a work unit which met the tests of validity and reliability dis-

cussed earlier). An application would be counted as examined when the work in the examination operation was completed and (1) the Type-A application was forwarded for analysis, or returned to the applicant, (2) the Type-B application was approved for renewal or extension and applicant notified, or (3) the questioned application was forwarded for analysis.

Steps 4 through 7 were combined into a single operation and defined as follows:

> The Analysis or Issuance Operation included that work involved in analyzing an application and supporting documents, classifying or reclassifying a plant, preparing letters regarding action taken, preparing or making appropriate entries in the case record, filing the case record, and routing "Notices of Action."
>
> Work unit - a case processed. An application would be termed a case when it entered the analysis process and would be counted as processed or completed when the final action had been taken, the letter to the plant forwarded, and "notice of action" sent to files.

The selection of two work units for the Licensing Activity made it possible to establish a very simple procedure for recording work volume in the activity. (See Part III, "An Integrated Reporting System.") A record was established at one point in a regional office to accumulate daily information on:

> Number of applications received;
> Number of applications completed;
> Number of applications pending.

Similarly, a single record was maintained in each regional office for accumulating daily information on:

> Number of cases received;
> Number of cases completed;
> Number of cases pending.

The type of action taken on applications, although not needed for work-measurement purposes, was information needed by the regional director. That information could be obtained from a sort and count of the "Notice of Action" forms at the time they were assembled for forwarding to the central office.

Work Units in the
Inspection Activity

The Inspection Activity was analyzed in the same manner as the Licensing Activity in order to determine the component operations. The primary steps were listed as follows:

Applicant Plants	Non-Applicant Plants
1. Applicant plants assigned for inspection in accordance with prescribed procedures.	1. Reports, leads, etc., on plants apparently engaged in the manufacture or distribution of the commodity covered by Public Law XXX, obtained from various sources.
2. In-plant inspections made.	2. Plant officials interviewed, plant records inspected, etc., to determine whether or not plant covered by the Law.
3. Inspection report prepared.	3. Finding made by inspector as to whether the plant is wilfully or unwittingly evading the Law.
4. Inspection reports reviewed for adherence to requirements and summary prepared on those plants in violation.	4. Brief report prepared on prescribed form requesting application blanks be forwarded to the plant; or compliance take action.
5. Summary transmittal to central office.	

In the Inspection Activity, the work performed on applicant plants differed so radically from the work required in locating non-applicant plants that it was necessary to classify the work into operations by type of plant:

> Applicant Plant Inspection Operation; and
> Non-applicant Plant Operation.

Consideration was given to the need for dividing the Applicant Plant Inspection Operation into two sub-operations -- inspection, and review -- but since every inspection was handled in the same way, there was no apparent need for further breakdown.

For the Applicant Plant Operation the work unit selected was an inspection completed, which was to be counted at the time the summary report was forwarded to the central office, or the inspection report was filed.

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Selection of a work unit for the Non-Applicant Plant Operation presented difficulties. From the viewpoint of countability, "a plant visited" might be used as a work unit, but the regional inspectors pointed out that the inspection time requirements differed widely among plants -- some inspections taking considerably longer than others, and some inspections requiring much more "non-visit" time than others, thus making total time considerably variable. It was decided, therefore, that no work unit would be applied to this operation. Employee-time expended in the operation would be recorded, which would permit the accumulation of information for use in evaluating the results obtained in the light of the time invested and the policy of the agency. Time reporting for the operation was also needed to account for the total time of inspectors so that their work-measurement reports could be verified against their time and attendance records.

Work Units in the
Hearing Activity

The Hearing Activity was analyzed as follows:

Applicant plants in violation	Plants refusing to apply for license
1. A three-man CBA board hears testimony presented by the inspector and counter-testimony by the plant officials.	1. A three-man CBA board hears testimony presented by the inspector and counter-testimony by the plant officials.
2. Report of hearing prepared, and copy of each hearing culminating in the imposition of penalties forwarded to central office.	2. Report of hearing prepared, and copy of each hearing culminating in the imposition of penalties forwarded to central office.

The character of the work involved in the Hearing Activity was identical for both types of plant. Therefore, there was no apparent need to divide that activity into operations. The compliance officers pointed out that the time requirements should be practically the same for each type of plant. They did add, however, that a plant in serious violation, as defined in the Procedures Manual, usually required more hearing time than one in minor violation, but over a long period they would average out.

The work-measurement staff, consequently, selected only one work unit for the Hearing Activity, a hearing completed, which was to be counted at the time the report of hearing was completed. Consideration of the need for classifying the work unit into "serious" and "minor" was postponed until data became available and the effect of the type of violation on the time requirements could be ascertained.

Thus, after attempting first to group work by organization segment, then by breaking work into individual processes or steps, the work-measurement committee finally classified the work by operations, proceeding through an analysis of function and activity. As a result, the work of the regional offices of CBA was measured by the following work units:

ACTIVITY AND/OR OPERATION	WORK UNIT
Regional Director's Office	None
Licensing Activity:	
Examination Operation	An application examined
Issuance Operation	A case processed
Inspection Activity:	
Applicant Plant Inspection Operation	An inspection completed
Non-Applicant Plant Operation	None
Hearing Activity	A hearing completed
Administrative Services	None

No attempt was made at this time to apply work measurement to the administrative services. It was generally agreed that appropriate work units could be found for each of the administrative services. However, the work-measurement committee adhered to its original three-part plan to measure the program work of the region before extending the system to cover administrative work.

Having completed the work classification, the management staff proceeded to select and define the time unit to be applied in measuring the employee-time expended in each operation.

SELECTING AN APPROPRIATE TIME UNIT

There are many possible units by which to measure employee-time -- man-second, man-minute, man-hour, man-day, man-week, man-month, and so on. In deciding which unit is most suitable for use in a continuous work-measurement reporting system, consideration should be given to the following points:

1. Record-keeping - The time unit selected should be one that can be recorded and reported with a minimum expenditure of time and effort on the part of the employees maintaining such records.

2. Verification - The time unit selected should be one that can be verified against official time and attendance records.

3. Precision - The time unit selected should be one which, when related to the work unit selected, will reflect a reasonably accurate expenditure of employee-time.

4. Comparison - Since the primary purpose of work measurement is to permit comparisons, the time unit selected should be considered from the viewpoint of comparability.

In addition, the time unit should be one that can be distributed easily between time on duty (including overtime) and time on leave or other authorized extended absence; and it should be one that can be distributed among the different operations on which the time on duty was spent.

Considering the Possibilities

The analysts applied each of the above considerations to the various time units that might be used.

Man-month or Man-week

In relation to the above criteria, the units man-month and man-week were not satisfactory.

The recording of time expended on a man-month or a man-week basis cannot be accomplished with a minimum expenditure of effort, without impairing accuracy. To record time on either one of those bases requires converting hours on duty, overtime, and on leave, to fractional equivalents of months or weeks. If daily recording of time is not required, there is the tendency for employees to

wait until month-end or week-end to distribute their time. When employee time was actually expended in a number of different types of work, the distribution would be purely and simply the employee's best guess.

To verify the resulting time records expressed as 20/23 man-months on duty, and 3/23 on leave, or 4/5 man-weeks on duty, and 1/5 on leave, with official time and attendance records expressed in terms of hours for a bi-weekly payroll period is too time-consuming to be realistic.

Subsequently, to calculate the relationship between the volume of work performed and the employee-time expended expressed in terms of man-months or man-weeks requires involved computations that are even more time-consuming.

Comparisons of one month with another present difficulties, because the duration of a working month varies. Also duration of the work-week has changed in recent years from 39 hours to 44, to 48, to 40, and may change again. In addition, in some agencies the number of days in the work-week or work-month vary at different locations.

Man-day

For many of the same reasons the man-day is not a suitable time unit for work-measurement purposes. Its use unnecessarily complicates record keeping because it requires the use of fractions and the conversion of overtime to man-day equivalents. Further the man-day may by law or by administrative discretion be 8, 9, 10, or more hours long.

Fractional Parts of a Man-day

Any fraction of a man-day (the man-second, man-minute, or man-hour) will afford reasonable precision and can be verified against time and attendance records. The man-second or man-minute, however, requires elaborate recording procedures, which are costly to maintain and complicate the verification process. Although those units may be used to good advantage in analyzing an individual job in which the time required to perform one unit of work is of short duration, they are not considered suitable for use in a continuous reporting system.

Man-hour

The man-hour has all the characteristics of a suitable unit to measure employee time for work-measurement purposes. Employee time can be recorded daily, charged to the operations in which the time was actually expended, and verified with the

official agency payroll records. In addition, such recording will require a minimum amount of time on the part of the employee.

For work-measurement purposes, man-hours can be distributed between (1) productive man-hours, hours an employee is on duty, including time worked in excess of the normal working day; and (2) non-productive man-hours, hours an employee is away from his official station on paid or unpaid leave, or on special training, drill, inspection or other non-routine absence.

Applying the Man-Hour

In applying the man-hour for work-measurement purposes, it is not sufficient to require that employee time be recorded for measured operations only; but the time of employees expended in unmeasurable work should also be required. This method will account for the total productive and non-productive time of all employees in the organization.

Since the regional director's immediate office was considered unsuited to the application of a work-volume unit of measure, CBA required only that the time of employees in that office be recorded and distributed between productive and non-productive time. Although the administrative services function was not yet being analyzed for work-measurement purposes, it was decided to record and report the time of all employees engaged in this function in order that the total time of the regional office could be accounted for.

For the measured operations, productive man-hours were to be charged to the operations in which the time was actually expended. Non-productive time was excluded from the time record of the operation in order that it would not be included in computing production rates. Non-productive time was, however, accumulated for the program function as a whole so that analyses of absenteeism, leave policy, and other conditions of work could be studied.

In establishing methods of recording time, the work-measurement staff also took into account the fact that travel performed during the normal working day represented a substantial expenditure of productive time in some work, particularly in the Inspection and Hearing Activities. In order to assure that the relationship established between work volume and employee-time would be comparable from region to region, provision was made

for recording travel time separately. The balance of the productive time expended in the Inspection and Hearing activities was to be related to the work volume performed in those activities.

COMMITTEE APPRAISAL OF ITS WORK

The committee appraised the work it had done to date. The members felt that in their selection of work and time units they had carefully considered the factors necessary to a successful installation.

1. They had worked through the administrator and the regional directors.

2. They had tried to keep the operating level free of overburdening detail which would have made the system unworkable, yet with sufficient detail for proper use.

3. They had explored alternate ways of measuring work and had selected the method most consistent with existing organization, records, procedures, and operating practices.

4. They had included the entire program organization, either in terms of work-load reporting, time reporting, or both.

In terms of the uses to which the system would be put, the committee was satisfied also. The data would be useful for both budgeting and the management purposes. Had the system been intended primarily for budget planning purposes, the committee might have considered some form of periodic sampling of work load and time. However, because the administrator wanted to emphasize the continuous improvement of management, the committee intended to prescribe a continuous reporting system. The committee members were convinced, in any event, that the same data were necessary for both purposes and thus it would be possible that the system which they had developed would provide that information. How successfully the information could be collected and used, however, would depend on how good a record and reporting system was developed.

Furthermore, the committee members had already decided to pilot-test the complete system after they had worked out the requirements for record-keeping and reporting. Such a test would permit working out (with those people, at all levels of the organization, on whom the successful operation of the system depended) as many of the flaws as possible before making the work-measurement system mandatory.

Part III

AN INTEGRATED REPORTING SYSTEM

An integrated reporting system for work-measurement purposes requires:

1. Basic Records	Uniform records for accumulating data and instructions for their maintenance.
2. Report Form	A standard report form for summarizing basic records and instructions for its preparation.
3. Summary Tables and Charts	A method for summarizing, analyzing, and presenting data on several reports.
4. Routing Plan	Procedures for routing reports upward through the organization and routing summaries downward.

Without such a system there will be little or no assurance that data are valid and comparable, that the computations made or the conclusions drawn are equitable, and that the results will become available in a readily usable form on a timely basis.

The component parts of an integrated reporting system described herein are applicable in a centralized as well as a decentralized organization, and no portion of the system can be omitted if the work measurement data are to serve the purposes for which they are intended.

BASIC RECORDS

The primary objective of a work-measurement system is to provide a basis for comparison which will afford management with factual information needed in improving the agency's efficiency.

Equitable comparisons are possible only when data on the volume of work performed and the employee-time expended are recorded in the same way, and in accordance with the same instructions through the medium of a prescribed record-keeping system which is applied uniformly throughout the agency.

A work measurement record-keeping system is composed of two parts: (1) the form or basic record for accumulating the necessary data; and (2) written instructions for maintaining each record.

Standardization of Record Forms

In general, the record should provide space for the daily entry of (1) information on the volume of work completed, and (2) the employee-time expended in producing that volume of work. In some cases it may be more feasible to establish one form for recording data on the volume of work and another for recording time.

In either case the forms should be standardized in the following respects:

1. Each form should be identified by a form number or symbol;
2. Each form should bear the name of the department and bureau using the form;
3. Each form should be identified by a short descriptive title;
4. Column headings and stubs should be clearly titled and numbered for cross-reference with the instructions;
5. Rulings should permit hand-written entries with columns wide enough for the largest anticipated entry;
6. Each form should provide space for entering the time period covered, name of employee maintaining record, name of the activity and/or operation measured, and space for periodic totalling of daily entries.

The over-all size of a basic record is governed by the amount of detail to be entered on the record, its manageability, and the availability of filing equipment.

The paper stock and the duplicating process should be determined from the standpoint of quantity requirements, ink or pencil entries, and length of time records are to be used and preserved. In general, a work-measurement record will not be used for more than one month and preserved more than one year. Therefore, it may be concluded that such records can be prepared on inexpensive stock.

These standards can be applied without exception in every agency, but the need for records and the content of the records prescribed to meet those needs must be determined separately for each agency.

Agency Determinations

It is important that an agency developing a work measurement record-keeping system establish the simplest possible set of records, so that the time expended in maintaining the records will be held at a minimum.

To accomplish that objective, agencies should keep the following points in mind:

1. Establish the least possible number of records which will produce the required data;

2. Avoid duplicating adequate records maintained uniformly throughout the agency, even though such records were originally designed for other purposes;

3. Make every effort to eliminate unnecessary records;

4. Wherever possible, require that the work-measurement record for an operation be maintained at a single control point in the operation instead of having each employee maintain an individual record.

The following examples of basic records illustrate the record-keeping requirements of the regional offices of CBA.

Work-load Records for CBA

In the hypothetical agency, study has shown that for the two component operations of the Licensing Activity, inventory data are needed for management purposes. Therefore, the following basic record, Figure 8, was considered for the Examination Operation and the Issuance Operation.

RECORD NO.—
APRIL 1946

C___ B___ A___

WORK LOAD RECORD

ACTIVITY:

LICENSING

MONTH ENDING _____ 19___

EMPLOYEE _____

OPERATION: EXAMINATION

DAYS OF MONTH	PENDING (1)	RECEIVED (2)	TOTAL (3) = (1) + (2)	COMPLETED (4)	PENDING (5) = (3) - (4)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
28					
29					
30					
31					
TOTAL					

FIGURE 8

The above record was proposed because most regions indicated need for daily information on the volume of work pending completion. However, further study of the needs of the regions indicated that such data were not significant on a daily basis, but that classification of the applications, by type, was more important. Therefore, in the final analysis the record shown in Figure 9 was prescribed.

For purposes of recording work-load data on the "Hearing Activity" and the "Applicant Plant Operation" of the "Inspection Activity," the record shown in Figure 9 was modified slightly and prescribed for use during the testing period. The record was adapted by changing the column heads to read as follows:

For the Inspection Operation: Column headings "New" and "Renewal" were changed to "First inspections" and "Reinspections."

For the Hearing Activity: Column headings "New" and "Renewal" were combined into a single column headed "Applicant Plants."

RECOM NO.—
APRIL 1946

C___ B___ A_

WORK LOAD RECORD

ACTIVITY: LICENSING

OPERATION: EXAMINATION

MONTH ENDING _____ 19 __

EMPLOYEE _____

DAYS OF MONTH	RECEIVED			COMPLETED		
	NEW (1)	RENEWAL (2)	TOTAL (3) = (1) + (2)	NEW (4)	RENEWAL (5)	TOTAL (6) = (4) + (5)
PENDING						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
28						
29						
30						
31						
TOTAL						
PENDING						

FIGURE 9

During the testing period, it was learned that the chief inspectors in six of the 10 regions had devised a form which they wished to continue to use because they were accustomed to it and it served their operating needs. This form was studied and prescribed for use in all regions, after making it agree with the forms design standards adopted by the agency. (Figure 10).

FORM NO. —
APRIL 1946

C___ B___ A_

WORK LOAD RECORD

ACTIVITY: INSPECTION

MONTH ENDING _____ 19 __

SUPERVISOR _____

INSPECTOR	OPERATION: APPLICANT PLANTS						
	NUMBER OF INSPECTIONS						
	ASSIGNED FOR MONTH	COMPLETED DURING MONTH					TOTAL
TOTAL							

FIGURE 10

The chief inspectors entered an "inspection completed" by tallying opposite the name of the inspector who completed the unit of work. By adapting the existing form so that it continued to serve the needs of the immediate supervisor as well as the work-measurements needs of the agency without any additional effort on the part of the reporting office, the good will and cooperation of the chief inspectors was assured, and record-keeping was kept at a minimum.

Time Records

Figure 11 is the record which was prescribed for distributing the time of a group of employees engaged in the same operation. It will be noted that this record is self-checking in that the entries opposite each employee's name can be verified against the official time and attendance records of the agency, and, by a few simple calculations, the total productive man-hours charged to the operation can be determined.

RECORD NO. — APRIL 1946 — C ____ B ____ A ____ — DISTRIBUTION OF MAN-HOUR EMPLOYMENT	ACTIVITY OR OPERATION: — DUTY HOURS THIS MONTH	MONTH ENDING: 19__ — SUPERVISOR:

EMPLOYEES ASSIGNED (1)	DAYS OF MONTH																MAN-HOURS				
	1/16	2/17	3/18	4/19	5/20	6/21	7/22	8/23	9/24	10/25	11/26	12/27	13/28	14/29	15/30	31	OVERTIME (2)	LEAVE PAID (3)	LEAVE W.O.P. (4)	DETAIL IN (5)	DETAIL OUT (6)
CODE: L- LEAVE WITH PAY; V- LEAVE WITHOUT PAY; T- OVERTIME PERFORMED; D- EMPLOYEES DETAILED																TOTAL					

SUMMARY

1. NUMBER OF EMPLOYEES BEGINNING OF MONTH		6. MAN-HOURS LEAVE WITH PAY	
2. MAN-HOURS EMPLOYMENT AVAILABLE THIS MONTH		7. MAN-HOURS LEAVE WITHOUT PAY	
3. MAN-HOURS OVERTIME PERFORMED THIS MONTH		8. MAN-HOURS DETAILED OUT	
4. MAN-HOURS DETAILED IN		9. TOTAL (SUM OF ITEMS 6, 7 and 8)	
5. TOTAL (SUM OF ITEMS 2, 3 AND 4)		10. TOTAL PRODUCTIVE MAN-HOURS (ITEM 5 MINUS ITEM 9)	

FIGURE 11

This form was prescribed for recording time expended in the "Examination Operation" and the "Issuance Operation," each of which is measured in a different work unit. It was also prescribed for the use of the regional director's office. In the latter activity work units had not been applied, but time recording was needed for work-measurement purposes.

It was found that in the small regional offices, employees worked on several operations which were measured in different work units. It was necessary, therefore, for work-measurement purposes, to prescribe a different type of time record for those offices. It was also found that the inspectors were away from their official stations a large share of the time and that in performing their work in the field, time was expended in travel, in inspecting applicant plants, in locating non-applicant plants, and in participating in hearings. Therefore, their time had to be distributed among the different types of work engaged in.

To meet those needs, an individual time record, Figure 12 was prescribed.

RECORD NO. ___ APRIL 1946 — C ____ B ____ A ___ — MAN-HOUR EMPLOYMENT RECORD	MONTH ENDING ________ 19___ — EMPLOYEE ________

ACTIVITY OR OPERATION	DAYS OF MONTH													TOTAL FOR MONTH
	1	2	3	4	5	6	4	25	25	27	28	29	30	31	
LICENSING ACTIVITY															
1. Examination operation															
2. Issuance operation															
INSPECTION ACTIVITY															
3. Applicant plant operation															
4. Non-applicant plant opr.															
5. Travel time on inspection															
6. Hearing activity															
7. Travel time on hearings															
8. Total productive hours															
9. Leave with pay															
10. Leave without pay															
11. Total hours															
12. Overtime hours included above							13. Remarks								

FIGURE 12

Instructions

The prescription of uniform records for accumulating data will not in itself assure the accumulation of the same data in the same way, unless each record is accompanied by instructions which are specific as to:

1. The definition of the operation to be measured;

2. The definition and description of the unit of measure to be applied;

3. The method for counting and recording such units.

Instructions should be reproduced for insertion in a loose leaf notebook. Although instructions may be placed on the reverse of a basic record, the notebook method is preferable because corrections and revisions of the instructions can be made without complete reprinting or destruction of records.

The paper stock should be of better quality than the basic records because it is assumed that the instructions will be used for long periods of time and frequently for reference purposes.

By way of illustration, the following instructions were prescribed to accompany the record shown in Figure 9 — Licensing Activity, Examination Operation.

C--B--A
April 1946

INSTRUCTIONS FOR THE MAINTENANCE OF WORK-LOAD RECORD NO. __

Work-load Record No. __ is the form prescribed for accumulating data on the licensing activity — one copy to be maintained for the Examination operation, and another copy for the Issuance operation.

Activity: Licensing. Included in this activity is that work performed in the receipt, examination, and final disposition of applications for licenses under Section ____ of P.L. XXX.

Operation: Examination. Included in this operation is that work performed in ascertaining whether the application received is complete in accordance with the legal requirements shown in the Procedures Manual _____ dated _____, 19 __.

Application for new license. An application for a new license is defined as an application for any plant which has never before applied to the regional office for a license, or has applied but never been granted a license.

Application for renewal. An application for a renewal of license is defined as an application from a plant for which a license has been issued at some previous time.

Responsibility. This record will be maintained on a daily basis by the supervisor of the examination operation or by a person designated by the reporting office as best situated to record these data.

Deadlines. Columns 1 through 6 of this record will be totalled at the close of business on the last day of the calendar month, initialed, and forwarded immediately to the person responsible for the preparation of the Monthly Work Measurement Report.

Pending, Cols. 1, 2, and 3. Enter here, for the first day of the month, the number of applications pending completion as of the close of business on the last day of the preceding month.

Received, Cols. 1, 2, and 3. Enter in this column the total number of applications received during each day. Do not count as received during any one day, letters or memoranda containing data on applications already counted as received at some previous time, on which additional information was requested.

Exception: If an application formerly received was returned to the applicant, count the returned application as received.

Completed, Cols. 4, 5, and 6. Enter each day the total number of applications for new licenses and renewal licenses on which any one of the following actions were taken:

(a) Application returned to applicant with letter or other communication for failure to comply with provisions of Section ____ of P.L. XXX.

(b) Questioned application forwarded to issuance operation for action.

(c) Application considered and license issued or applicant notified of denial.

Exception: Do not count as completed those applications held awaiting reply to correspondence requesting further information.

Pending, Cols. 4, 5, and 6. Enter at the close of the last day of the calendar month the total number of applications, which at the close of the day are held for correspondence and those not countable as completed in accordance with above definition.

Verification of totals. Before the record is forwarded, the number of applications Pending (top of record) "Columns 1, 2, 3," should be verified against the pending figure, columns 4, 5, and 6 for the last day of the previous month. The arithmetic accuracy of the current record should be verified in the following manner:

> Pending, Cols. 1, 2, and 3, plus total received during month, (Cols. 1, 2, and 3) minus total completed (Cols. 5, 6, and 7) should equal the number pending on the last day of the month, (Cols. 5, 6, and 7).

In like manner, each of the other prescribed records were accompanied by specific instructions.

Standardization both as to content and format, applied to both records and instructions, will assist in the accumulation of data that are valid and comparable from one location to another and from one time period to another. The results obtained will provide a sound basis from which to compute the relationship between the volume of work performed and the employee-time expended so that valid comparisons can be made.

REPORT FORM

Having designed the tools and prescribed the methods for accumulating data, it is necessary to provide a medium for consolidating the several records so that the data become available in a readily usable form.

This requires the development of an adequate report form and instructions for its preparation. To be adequate, the report form should conform to the forms design standards used for basic records, with the exception that the report should be planned for standard typewriter preparation instead of manual entries. The report should be so designed that:

1. The data accumulated on the basic records can be entered with a minimum expenditure of time and effort on the part of the reporting office;

2. The summarization of records serves a useful purpose at the reporting level;

3. Reports from several reporting offices can be consolidated readily at a central point.

The over-all size of the report form is governed by the amount of detail to be entered on the form, the size of the entries, and the methods to be employed in preparing and summarizing the form. In general, it is more expedient to use several 8" x 10½" or 8" x 14" sheets than to use one large sheet which requires transcribing or filing equipment not already available and used for other purposes. On the other hand, the crowding of a mass of detail on one 8" x 10½" page may make the information virtually useless.

The content of the form is governed by the needs of those agency officials who have authority to improve management on a broader scale than the immediate supervisors who maintain the basic records. In many instances, the detail required at the operating level is not needed and is often not significant at higher levels. Therefore, careful consideration must be given to including on the report form only those data which will serve a useful purpose as the report moves upward through the agency.

Following is an illustration of the report form prescribed for use in CBA.

Illustration of Report Form

Figure 13 is the report form prescribed for the use of the regional offices of CBA.

FORM NO. ___
APRIL 19 6

C _____ B _____ A ___

MONTHLY WORK MEASUREMENT REPORT

REGION _____

MONTH ENDING _____ 19 ___

SIGNATURE _____

MEASURED ACTIVITIES SUMMARY	VOLUME (WORK UNITS) (1)	PRODUCTIVE MAN-HOURS EXPENDED (2)	MAN-HOURS PER WORK UNIT (3)
LICENSING ACTIVITY			
* EXAMINATION OPERATION			
1. Applications - Pending beginning of month			
2 - Received			
3 - Total			
4 - Completed			
5 - Pending end of month			
ISSUANCE OPERATION			
6. Cases - Pending beginning of month			
7. - Received			
8. - Total			
9. - Completed			
10. - Pending end of month			
INSPECTION ACTIVITY			
APPLICANT PLANT OPERATION			
11. Assigned for month			
12. Completed during month			
13. Travel			
HEARINGS ACTIVITY			
14. Hearings Completed			
15. Travel			

EMPLOYMENT SUMMARY	PRODUCTIVE MAN-HOURS (4)	NON-PRODUCTIVE MAN-HOURS (5)	TOTAL (6)
6. Regional Director's Office			
7. Non applicant plant operation			
8. Measured operations and activities			
9. Total			
10. Number of employees end of this month			

FIGURE 13

The report can be prepared with a minimum expenditure of time and effort in the reporting office, as shown in Figure 14.

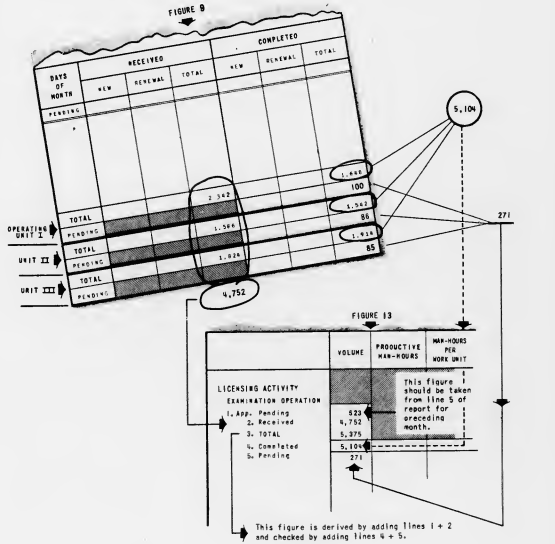

FIGURE 14

The report itself gives each regional director a timely summary of the work in his region. He can compare the current situation with the past merely by placing the report in juxtaposition to reports for earlier months.

It will be noted, however, that all the data accumulated at the operating level are not brought forward in the work-measurement report because it has been determined that some of those data serve no useful purpose on a monthly basis at the regional or central office level.

For example, it was suggested that monthly data on the number of new and renewal applications completed in the Issuance Operation could be used to verify a count of "Notice of Action on License Application" forwarded by the Regions. It was pointed out that the number of "Notices" received represented an unduplicated count of license applications, while, for work-measurement purposes, a single application might justifiably be counted more than once. Secondly, the number of units of work reported as completed in the Issuance Operation might exceed or be less than the number of "Notices" received in the central office because of the procedure of mailing "Notices" but once a week.

Therefore, the work measurement report was simplified by omitting those items of information, and other methods of control were established for verifying that the Central Office received a "Notice" of action taken for every application handled.

Instructions

The written instructions for preparing the report form should conform to the standards for instruction writing shown under basic records. If the instructions for the basic records are comprehensive, the instructions for preparing the report form can be greatly abbreviated. Restatement of the definitions of operations and work units will not be required. By indicating the column and line entry numbers on a specified record to be inserted in the column and line spaces of the report form, repetition can be avoided.

WORK MEASUREMENT SUMMARIES

As stated earlier the "Monthly Work Measurement Report" designed for the use of regional offices in CBA provides a useful summary for each reporting office, but at that point its usefulness stops. On the basis of the data reported, one region cannot compare its performance with the performance of other regions in the agency, and officials in the central office cannot use a number of separate reports to good advantage. It is necessary, therefore, that a plan for presenting pertinent comparative analyses of work-measurement data be developed so as to provide useful summaries to those persons who have authority to improve management and control operations.

The very nature of the work-measurement reports lends itself to quantitative comparisons, but it cannot be concluded that tabular summaries are the only answer. There are three methods for presenting quantitative data—text, tables, and charts. Each of those methods has advantages and limitations and no one should be used to the exclusion of the others. Instead the plan should provide for a balanced presentation using all three methods but to achieve the "proper" balance is a matter of judgment controlled by:

1. The purpose of the summary;
2. The nature of the data;
3. The needs of agency officials.

Although there are no specific rules for developing a balanced plan for presentation, there are certain factors which should be considered.

First, a work-measurement system is designed to permit comparisons of one segment of an organization with another and like operations anywhere in the organization. Therefore, a "master" tabular summary should be developed which permits such comparisons, in a clear-cut manner, at periodic intervals.

Second, the plan should provide for tabular or graphic analyses, or both types, for comparing the performance of the several segments of the organization and of like operations on a trend basis.

Third, special tabular or graphic analyses should be planned for the use of those individual officials who have need for such analyses, and for the information of employees engaged in work which is measured.

Fourth, all tables and charts should be simple and direct, and not confused by the inclusion of unrelated or unnecessary information.

The over-all size of summaries cannot be suggested on a general basis, because the size is governed by the purpose of the summary, its legibility, and the available duplicating and drafting resources of the agency.

Presentation Plan for CBA

Tabular. To provide the necessary comparisons of performance of the various segments of the agency and of like operations, the tabular summary shown in Figure 15 was proposed. It will be noted that this summary does not include all the data reported on the "Monthly Work Measurement Report," because the summary is intended to permit comparisons of performance and to show the two factors on which performance was calculated—the volume of work performed and the employee-time expended. Furthermore this table can be prepared with a small expenditure of time and, therefore, can become available monthly soon after the close of the period covered by the data.

SUMMARY REPORT —
APRIL 1946

C ____ B ____ A ____

MONTHLY WORK MEASUREMENT SUMMARY

MONTH _____ 19____

REGIONS	PERCENTAGE MEASURED	IN UNMEASURED ACTIVITIES	IN MEASURED ACTIVITIES	MEASURED ACTIVITIES AND OPERATIONS			
				LICENSING ACTIVITY		INSPECTION OF APPLICANT PLANTS OPERATION	HEARING ACTIVITY
				EXAMINATION OPERATION	ISSUANCE OPERATION		
AGENCY							
TOTAL MAN-HOURS (PRODUCTIVE AND NON-PRODUCTIVE)							
PERFORMANCE							
VOLUME							
PRODUCTIVE MAN-HOURS							
REGION 1							
TOTAL MAN-HOURS (PRODUCTIVE AND NON-PRODUCTIVE							
PERFORMANCE							
VOLUME							
PRODUCTIVE MAN-HOURS							
REGION 2							

FIGURE 15

The summary shown in Figure 15 was designed for distribution to the agency administrator, the budget officer, division heads at the central office and the regional directors. After reviewing one such summary, however, the administrator requested a tabular summary which would provide him with less detail and, at the same time, show a comparison of the current month with the preceding month. The budget officer asked for information which translated man-hours into employee equivalents; and the personnel officer requested the information on the number of employees at the end of the month. To meet those requests, the summary shown in Figure 16 was developed.

SUMMARY REPORT NO. ___
APRIL 1945

MONTH _____ 39 ____

C ____ B ____ A ____

AGENCY WORK MEASUREMENT SUMMARY

	LICENSING ACTIVITY		INSPECTION OF APPLICANT PLANTS	HEARING ACTIVITY
	EXAMINATION OPERATION	ISSUANCE OPERATION		
VOLUME OF WORK COMPLETED This month Last month Percentage change				
PRODUCTIVE MAN-HOURS EXPENDED This month Last month Percentage change				
PERFORMANCE This month Last Month				

MAN-HOURS	TOTAL		PRODUCTIVE				NON-PRODUCTIVE	
			IN MEASURED ACTIVITIES		IN UNMEASURED ACTIVITIES			
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
This month		100.0						
Last month		100.0						

EMPLOYEE EQUIVALENTS

	TOTAL	PRODUCTIVE	NON-PRODUCTIVE
This month			
Last month			

ACTUAL NUMBER OF EMPLOYEES:

End of this month _____

End of last month _____

CC: BUDGET OFFICER
PERSONNEL OFFICER

FIGURE 16

In addition, the chief of the Inspections Division at the central office demonstrated his need for information from the "Monthly Work Measurement Report" which would permit him to establish a relationship between the volume of applicant plant inspections assigned to and completed by each region, and the number assigned by him to each region for completion during the fiscal year. Although it was pointed out to him that graphic portrayal of progress would be more effective, he preferred the tabular summary shown in Figure 17.

SUMMARY REPORT ____
MAY 19 6 .

C ____ B ____ INSPECTION REPORT-APPLICANT PLANT | A ____ INSPECTION REPORT

REGION	INSPECTIONS ASSIGNED FOR YEAR	CUMULATIVE TOTALS - JULY		AUGUST		1946-1947 JUNE	
		ASSIGNED	COMPLETED	ASSIGNED	COMPLETED	ASSIGNED	COMPLETED
TOTAL							
REGION 1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

FIGURE 17

Graphic. The limitations of the monthly tabular summary, Figure 15, soon became apparent. Trend comparisons were needed as well as comparisons of one region with another and like operations for a single month. To overcome this limitation, it was proposed that each region maintain a wall chart similar to the one shown in Figure 18.

This chart was preprinted centrally, in blank, and so arranged that it could be extended monthly by the regional office at the time the "Monthly Work Measurement Report" was completed. It was recommended that a similar chart be maintained for each operation and activity measured in a single work unit so that employees performing measured work could be informed of their monthly performance and observe the trend being established.

Similar charts were developed and maintained for the administrator showing performance trends for the agency as a whole, and a separate chart for each measured activity or operation was prepared for the respective division heads of the central office. In this way, marked changes in performance in any operation or activity were quickly detected and inquiry as to the cause could be made or corrective action taken.

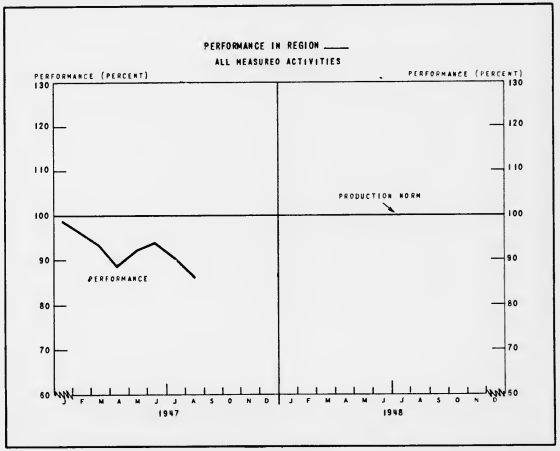

FIGURE 18

Although the chart shown in Figure 18 was extremely useful, it too had its limitations when it came to analyzing the agency trend because it was impossible to spot whether one or a few regions were responsible for a sudden upward or downward change in agency performance.

The chart shown in Figure 19 was devised for analytical purposes, to show monthly changes in performance region by region, activity by activity, but later this chart was superseded by the chart in Figure 20.

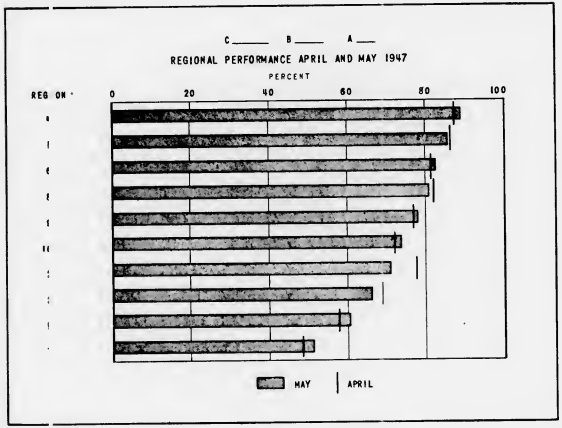

FIGURE 19

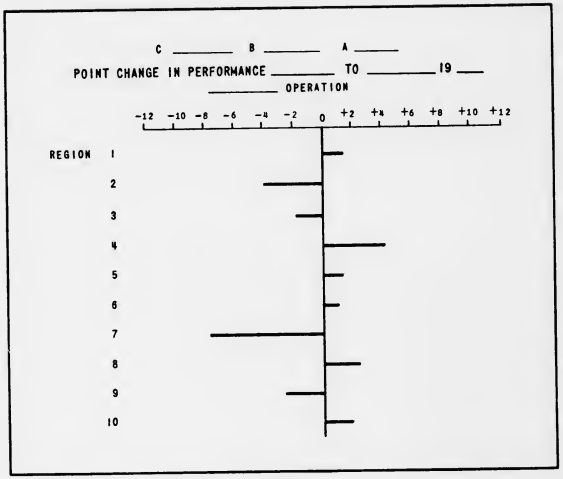

FIGURE 20

The latter chart could be prepared on the typewriter on a preprinted form designed for the purpose, and made up only at those times when it served a useful purpose in analyzing the agency trend—either when one or more activities showed marked decline or increase in performance, or when regional performances offset one another resulting in no marked change in the over-all trend.

It was found that the budget officer could use to good advantage a graphic presentation of employee equivalents of productive and non-productive man-hours as a control of budget allocations and for noting trends. The chart shown in Figure 21 was designed so that it could be extended monthly without complete redrafting.

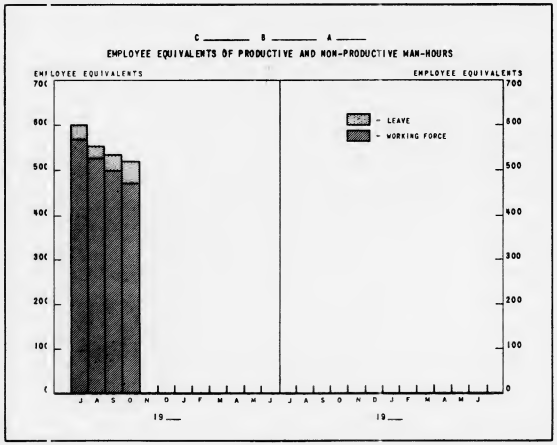

FIGURE 21

Other. After careful study of the data reported on the volume of applications received, completed, and pending in the Examination and Issuance Operations, it was agreed that semi-annual tabulations showing totals and the percentage distribution of those totals, by regions, were of significance in planning future workloads. Therefore, on January 20 a tabulation covering the first six months of the fiscal year was made available and on July 20, a tabulation for the entire fiscal year was presented.

In CBA, brief analytical text statements were planned to point out serious deviations from the norm, the factors causing such deviations, and the action taken or planned. It was also planned that from time to time special reports would be issued describing situations that were revealed through comparisons based on the work measurement system, the action taken to remedy such situations, and the effects produced by such action.

It will be noted that only those tabulations and charts were prepared for which there was a demonstrated need; that the types of summaries to be used at each level were prescribed; and that charts of limited usefulness were replaced by those which were more effective and easier to prepare. It is important that continuous scrutiny be made of the presentation plan originally developed and that it be changed to meet the changing needs of the agency and its staff.

ROUTING PLAN

At this point most of the requirements of an integrated reporting system have been satisfied. A uniform record-keeping system has been prescribed to assure the accumulation of valid and comparable data in each reporting office. The report form has been geared into those records and into the plans for summary tabulations to facilitate consolidation at various levels. Useful tabular and graphic summaries have been planned to meet the needs of the officials in CBA. Insofar as integration is concerned the system is complete, but the information obtained through the use of this system will be wholly unsatisfactory if it is not presented on a timely basis.

Timeliness is the essence of any report which is intended to serve as a basis for action or decision. As one of the principal management control devices, work-measurement results must be timely to be useful.

To assure that work-measurement data become available in time to be used effectively, it is necessary to develop a routing plan which will prescribe the channels for transmitting the records and reports upward through the organization and the summaries downward in accordance with a specific time schedule.

There are no generally applicable rules for developing a routing plan. Each agency has to determine, in terms of its own needs and purposes, the dates on which work-measurement summaries should become available. In general, a monthly summary similar to the "master" tabulation shown in Figure 15 should be presented not later than the 15th day of the month following the month covered by the report; a quarterly summary not later than the 20th of the month following the close of the quarter; and an annual summary not later than the 30th of the month following the close of the year.

In CBA, the date for completion and mailing of the "master" tabular summary was set for the 12th of each month, so that the regional offices on the West Coast would have their copy not later than the 15th. With this date as a goal, the entire system, described in Parts I, II, and III of this release, was devised so that that date could be met. The routing plan for CBA prescribed that:

1. The basic records were to be consolidated and summarized between the 1st and the 5th of the month;

2. One copy of the "Monthly Work Measurement Report" was to be mailed to the central office not later than the 5th of the month;

3. The methods for editing the reports were planned and a system was devised for obtaining corrections from the regions between the 5th and the 10th of the month.

4. Provision was made for the exceptional situations. If, on occasion, a region could not get its report into the mail on time, the region was required to telegraph the information on volume of work completed and productive man-hours expended for each of the measured operations — 8 items in all.

The CBA experience illustrates that a satisfactory routing plan, which will assure promptness in the presentation of a useful analytical summary, involves (1) ascertaining the date on which operating officials must take the actions which are based on or influenced by work-measurement reports; (2) working backward from that date to the dates on which each step in the reporting and consolidation process must be completed; (3) engineering the reporting system so that each deadline is attainable; and (4) to assure the attainment of each deadline, specifying the responsibilities of each level in the reporting and consolidation process.

PILOT TEST

The committee regarded a pilot installation as important. Without it they could not be sure that the system was workable, and that faults in the selection of work units and in the writing of instructions for record keeping and reporting were eliminated before the system went into operation.

Regions II, IV, and VII were selected for the pilot test because they were not identical in organization, size, or staffing. They might, therefore, reveal defects early, by the very nature of their dissimilarities.

When reports began to come in the production rates (man-hours per work unit) were watched. Any significant changes over the sample reporting period might signal the presence of some fault in the system.

As a result of the trial installation in the three regions, only minor revisions had to be made before installing the system in all regions and proceeding with adaptation of the system to the administrative services throughout the agency and to the program activities in the central office.

However, the same degree of care should be taken in observing the operation of the system after it is installed, as during the pilot period. Such considerations as the following should be observed:

1 Variations caused by errors in reporting resulting from ambiguity of instructions. Whenever it is found that the instructions are not clear, as demonstrated by the fact that employees are recording work load or time, according to too many different interpretations, immediate steps should be taken to clarify the particular instruction that is being misinterpreted.

2 Variations caused by different working procedures. It may be correct to assume that each organization unit in a decentralized agency follows the working procedure prescribed by a central office. A local director, however, may introduce detailed changes which, while consistent with the general procedure, will affect the production rate seriously. Some changes introduced locally will cut the time required to produce a unit of work, while other changes will increase the staff time required to produce a unit of work.

Any procedural innovations developed locally should be carefully studied by O & M before they are installed in all offices or withdrawn from any office. The primary considerations are the effect of local changes on both the production rate and the quality of work produced. An office expending very few man-hours per unit of work may be sacrificing quality while the office expending a very large number of man-hours per work unit may be striving for absolute perfection. There must be some balance between the two.

3 Variations caused by local conditions, or the needs of the area served. In government work variables tend to exist which cannot be entirely eliminated. For example, the time required to perform the same type of work at different locations may of necessity vary because the conditions under which work is performed vary, or the needs of the area served may vary.

4 Variations resulting from lack of trained personnel, operating manuals, etc. When wide variations in the production rate obtain, an investigation may disclose the need for training, the need for writing or rewriting staff manuals, and related factors which management can take steps to correct.

5 Variations caused by the work-measurement system itself. Wide variations may occur from month to month in the production rate for the same operation in the same office. The variation may be due entirely to the method of reporting called for by the work-measurement system. Because a work unit is to be reported for work-measurement purposes, when it is completed, it is possible in some instances that a majority of the time expended in completing a unit of work may have been expended and reported in a period prior to the period in which the work unit was completed and reported.

For example, Region I in CBA may report 1,000 applications examined in April with the expenditure of 480 man-hours that month. In March, the report may have shown 100 work units completed with the expenditure of 800 man-hours. The production rates would be:

March 8.0 man-hours per application examined
April 0.5 man-hours per application examined

Over a period of several months wide variations, resulting from the method of reporting, should wash out. If they do not, the situation needs investigation.

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